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(71) Applicant (for all designated States except US): **FIELD-TURF TARKETT INC.** [CA/CA]; 8088 Montview, Montreal, Quebec H4P 2L7 (CA).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **GILMAN, John** [CA/CA]; 15 Lyncroft, Hampstead, Quebec H3X 3E3 (CA). **TITTERSHILL, Ian** [GB/GB]; 32 Glendon Street, Stanley Common, Derbyshire, GB DE7 6GQ (GB).

(74) Agent: **MCCARTHY TETRAULT LLP**; Box 48, Suite 4700, TD Bank Tower, Toronto, Ontario M5K 1E6 (CA).

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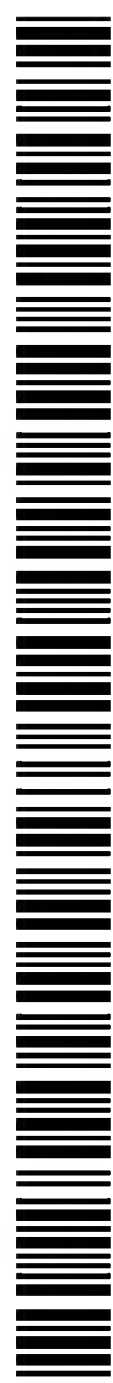
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(54) Title: A METHOD AND APPARATUS FOR A BASE FOR A SYNTHETIC TURF SYSTEM

(57) Abstract: The present invention is directed to a method and apparatus for a synthetic turf system including a turf layer having a plurality of synthetic fibers attached to a backing and lying over a base layer. A binder is applied to a base layer to support the turf layer.



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A METHOD AND APPARATUS FOR A BASE FOR A SYNTHETIC TURF SYSTEM

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DESCRIPTION

RELATED APPLICATIONS

[Para 1] This application claims benefit to the filing date of U.S. Provisional Patent Application Serial No. 60/594,683, filed April 28, 2005.

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TECHNICAL FIELD

[Para 2] The present invention relates to synthetic turf systems. More specifically, the present invention is directed to an improved base for synthetic playing surfaces.

15

BACKGROUND OF THE INVENTION

[Para 3] Maintenance of natural grass surfaces on athletic playing fields or landscaped areas is expensive and time consuming. Natural turf surfaces deteriorate under heavy use and some areas wear away to expose the underlying soil, thus facilitating an undesirable accumulation of water and mud. Synthetic surfaces have been developed to reduce the expenses associated with maintaining natural grass areas and to provide a more dependable playing surface with increased durability.

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[Para 4] When subjected to heavy or intense use over a period of time, the base layer of either natural or synthetic turf surfaces may be repetitively compressed and released by players or playing objects—ball, equipment—hitting the surface. In the case of soil, some natural resilience to impact is provided, and the rebound is affected by moisture, particle size of the base material, and inherent resilience of the base material.

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[Para 5] A synthetic turf surface generally includes a backing containing a plurality of individual fibers—strips or ribbons—of synthetic material. Some synthetic turf surfaces are configured in rows of strips or ribbons extending vertically

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and upwardly from the backing. The ribbons of the synthetic material typically extend a short distance above the backing material. Often, a particulate material, e.g., infill, is interspersed among the synthetic ribbons. The infill is selected to provide resiliency and softness to the synthetic surface in accordance with desired playing characteristics.

[Para 6] The infill, backing, and plurality of synthetic ribbons are installed over a base layer or substrate of soil and/or compacted material having good drainage characteristics, e.g., stone, soil, sand, rubber-like particles, or an aggregate combination thereof. The individual particles of base material are not bound together, and the resilience of the overall base layer is relatively low.

[Para 7] Some efforts made thus far in the synthetic turf industry to combat the wearing away of the backing have been directed to providing alternative base structures for synthetic turf systems. One such alternative base structure includes a layer of ground rubber over which the backing and synthetic ribbons lie. Although the ground rubber is less abrasive, the increased resiliency associated with the added ground rubber layer can, in some circumstances, be excessive. More importantly, even though the ground rubber may be compacted, the individual particles can remain susceptible to displacement due to indirect contact by the players and equipment, and to the forces associated with drainage.

[Para 8] Although binders applied to a base layer of aggregate material has been known in some applications, no such mechanism is known to have been utilized in the application of synthetic turf systems incorporating of synthetic fibers.

[Para 9] The present invention is provided to address these and other considerations.

SUMMARY OF THE INVENTION

[Para 10] The present invention provides a synthetic turf system comprising a backing having a plurality of synthetic fibers attached thereto and a binder applied to a base layer wherein the backing lies over the base layer.

[Para 11] A further aspect of the present invention includes the binder comprising a means for resiliency.

[Para 12] An additional aspect of the present invention includes the binder comprising a means for porosity.

[Para 13] Another aspect of the present invention is directed to a method of providing a base layer for a synthetic turf system comprising a plurality of synthetic
5 ribbons attached to a backing wherein the backing lies over the base layer.

[Para 14] An object of the present invention is to provide a base structure for a synthetic turf system with improved stability, impact absorption, and drainage characteristics.

[Para 15] Other advantages and aspects of the present invention will become
10 apparent upon reading the following description of the drawings and detailed description of the invention.

DESCRIPTION OF THE DRAWINGS

[Para 16] FIG. 1 is a cross-sectional view of the synthetic turf system of one
15 embodiment of the present invention; and,

[Para 17] FIG. 2 is a cross-sectional view of the synthetic turf system of an alternate embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[Para 18] While the present invention is capable of embodiment in many
20 different forms, there is shown in the drawings and will herein be described in detail, preferred embodiments of the invention with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the broad aspect of the invention to the embodiments
25 illustrated.

[Para 19] FIG. 1 depicts one embodiment of the present invention wherein a synthetic turf system 10 includes a backing 12 positioned over a base layer 14 of material 16. The backing 12 and the base layer 14 can include any number of layers. The backing 12 can include primary and secondary layers and can include woven,
30 non-woven, knitted, spun-bound, sprayed, etc., configurations. Interspersed throughout the backing 12 are synthetic fibers 18 (ribbons or strips) that function as

the blades of grass of the synthetic turf system 10. The synthetic ribbons 18 are operably attached to the backing 12 and may extend through any number of layers of the backing 12. The synthetic ribbons 18 extend vertically and upwardly from the backing 12 and can include any type of material or configuration, such as, but not limited to: tufted rows of strips or ribbons, looped pile, cut pile, cut and looped pile; and variable or uniform length, stiffness, and color.

[Para 20] The base layer 14 may comprise, for example, a layer of soil 16 shown in FIG. 1, or the base layer may include an additional layer 20 such as a tier of granular aggregate material, e.g., stone, crushed stone; as shown in FIG. 2. Any layer of material in the base layer 14 can include one or more materials, e.g., stone, gravel, etc., comprising discrete particles or granules of similar or different shapes or sizes. Whether or not the base layer 14 includes one or more layers of materials, it is typically desired that the base layer have a porous property to facilitate drainage of the synthetic turf system. As such, the base layer 14 possesses a level of porosity that facilitates water removal near the playing surface. A drainage system (not shown) utilizing UPVC may further be incorporated into the synthetic turf system to supplement the inherent porous characteristic of the base layer 14.

[Para 21] Prior to the installation of the backing 12 over the base layer 14, the base layer may be screeded, leveled, and compacted to a sufficient depth. A binder 22 is applied to the base layer 14 to provide stability and resiliency to the synthetic turf system 10, while substantially retaining the inherent porosity of the base layer. In some instances, the porosity of the base layer 14 will be improved because particles of the base layer are bound and cannot migrate through the base layer. That is, the binder 22 facilitates the adhesion of base layer's particles while simultaneously maintaining the base layer's inherent porosity. As such, displacement of individual particles of the base layer 14 during drainage is significantly reduced by the binder 22.

[Para 22] The base layer 14 may contain little or no resiliency. Because some level of resiliency is desired in a synthetic turf system, resilient materials are frequently utilized as a part of the infill (not shown) interspersed above the backing 12 and among the plurality of synthetic ribbons 16. The infill may include minute

particles such as granules of sand, rubber, and combinations thereof. Because the infill particulate material is loose and lies above the backing layer 12, a portion of the resilient characteristic of the synthetic turf, i.e., infill, is partially exposed to direct contact from a player or a player's equipment and may be susceptible to displacement. Accordingly, maintenance of a synthetic turf system can often require periodic replacement or repositioning of the infill among the synthetic ribbons 16.

[Para 23] Besides its own inherent porous characteristic, the binder 22 also includes resilient properties that can contribute to the overall resilient properties of the synthetic turf system 10. Other material properties of one embodiment of the binder 22 utilized in the present invention include: being substantially non-combustible; having an approximate density range of 1300-1420 Kg/M³ (@ 20° C); having an approximate viscosity range of 20-500 Mpas (@ 20° C); having a pH value greater than 11.45; having a boiling point of approximately 100° C; having a melting point of approximately -3° C; and, having a vapor pressure.

[Para 24] The binder 22 preferably comprises a composition of sodium silicate and a flow mixture; the flow mixture including ethyleneglycol diacetate, a hardening agent, a surfactant, and water. In one embodiment of the present invention, the ratio mixture of the binder 22 is two parts silicate to one part ethyleneglycol diacetate and surfactant; and the ethyleneglycol diacetate is a mixture of four parts water to one part ethyleneglycol diacetate and surfactant. Inasmuch as the mixture of the binder 22 may be colorless, a dye may also be included. It is to be understood that the composition of the binder 22 can include any combination of materials so long as the binder exhibits a porous and/or resilient characteristic.

[Para 25] The surfactant essentially delays the hardening of the binder 22 and enables this final mixture to be transported through a hose and sprayed atop the base layer 14. Preferably, the binder ingredients are present at the site of the to-be-installed synthetic turf system and the binder 22 is mixed at the installation site. That is, silicon is held in one tank and the flow mixture (water, hardener, ethylene glycol diacetate, and surfactant) is pre-mixed and held in another tank. The contents of the two tanks are drawn together into a mixing chamber to create the binder 22. Once mixed, a pump and spray wand are used to apply the binder to the surface of the base

layer 14. In one embodiment, a Mono CP series pump (2:1 flow rate and 60% pressure) in combination with the spray wand (500mm width) is used to apply the binder 22 to the base layer 14.

5 [**Para 26**] The porosity of the surface of the base layer 14 is maintained by the application of the binder 22 and in some cases, may be improved because the individual particles of the base layer 14 are precluded from migrating. During application of the binder 22 to the base layer 14, a chemical reaction occurs between the silicon, ethyleneglycol diacetate, and surfactant. The sodium silicate sets around the material of the base layer 14, e.g., aggregate, and binds it. The ethyleneglycol
10 diacetate reacts and hardens the sodium silicate. After the binder 22 is applied to the base layer 14, the artificial grass can be laid over it.

[**Para 27**] Several factors are considered when determining the amount and make-up of the binder 22; in particular, the amount of resiliency desired in the synthetic turf system, the type of base layer utilized, and the desired amount of
15 penetration of the binder into the base layer, e.g., 45 mm. In one embodiment of the present invention, the flow mixture includes an aqueous solution containing less than 20% non-toxic biodegradable surfactant, less than 5% ethanol, less than 0.03% myacide (preservative) and a trace of brilliant blue dye.

[**Para 28**] A variety of means can be utilized to apply the binder 22 to the base
20 layer 14. Preferably, the binder is sprayed onto the base layer 14 at a rate of substantially 1.5 - 4 liters per square meter; and the rate of spraying is dependent upon the pump speed and the operator. The amount of binder 22 delivered to the base layer is dependent upon the desired characteristics of the synthetic turf system, e.g., type of application of the synthetic field, the amount of desired infiltration into the
25 base layer, e.g., 45 mm; resiliency, and the type of base layer, e.g., stone base of 10mm — dust. A short time after the binder 22 has been applied to the base layer 14—10 to 15 minutes—the surface can be walked on without marking. After approximately 24 hours, the binder 22 is set.

[**Para 29**] The application of a resilient binder 22 to the base layer 14 beneath the
30 backing 12 improves the stability of the base layer's composition and provides the synthetic turf system 10 with a reliable basis of resiliency. That is, the bound

aggregate material of the base layer 14 lying beneath the backing 12 is isolated from direct contact with a player or a player's equipment. Prior to the installation of the artificial grass on top of the treated base, the bound aggregate material is also less vulnerable to other exterior forces—such as wind and those associated with surface
5 drainage—and is therefore less susceptible to displacement. In contrast, the infill above the backing is exposed and susceptible to displacement; and its associated level of resiliency remains vulnerable to exterior forces.

[Para 30] Furthermore, because the base layer 14 and binder 22 of the present invention provide a consistent level of resiliency to the synthetic turf system 10, a
10 lessor amount—or perhaps none—of the exposed resilient infill may be needed among the synthetic ribbons 16 to achieve the desired performance characteristics of the overall synthetic turf system 10.

[Para 31] It is further contemplated to include a biocide within the binder 22 to prevent algal and fungal growth underneath the backing 12. The biocide is held in
15 suspension by the surfactant composition of the binder. Due to its PH value of approximately 11.45, the binder may be utilized to prevent plant growth, e.g., weeds, in application incorporating artificial grass, e.g., airport runways.

[Para 32] While specific embodiments of the present invention have been illustrated and described, numerous modifications come to mind without significantly
20 departing from the spirit of the invention, and the scope of protection is only limited by the scope of the accompanying claims.

CLAIMS

What is claimed is:

- 5 1. A synthetic turf system comprising:
 a base layer;
 a binder applied to the base;
 a backing lying over the base; and,
 a plurality of synthetic fibers attached to the backing.
- 10 2. The synthetic turf system of Claim 1 wherein the binder comprises a means
 for resiliency.
- 15 3. The synthetic turf system of Claim 1 wherein the binder comprises a means
 for porosity.
- 20 4. The synthetic turf system of Claim 1 wherein the binder comprises:
 sodium silicate;
 ethyleneglycol diacetate;
 water;
 a hardening agent; and,
 a surfactant.
- 25 5. The synthetic turf system of Claim 4 wherein the binder comprises a means
 for resiliency.
6. The synthetic turf system of Claim 4 wherein the binder comprises a means
 for porosity.
- 30 7. The synthetic turf system of Claim 1 wherein the base layer comprises soil.

8. The synthetic turf system of Claim 1 wherein the base layer comprises an aggregate material.
9. The synthetic turf system of Claim 8 wherein the aggregate material includes
5 stone.
10. A method of providing a base layer for a synthetic turf system comprising a plurality of synthetic ribbons attached to a backing wherein the backing is positioned over the base layer, the method comprising the steps of:
- 10 compacting a base layer; and,
applying a binder to the base layer.
11. The method of Claim 10 wherein the binder comprises a means for resiliency.
- 15 12. The method of Claim 10 wherein the binder comprises a means for porosity.
13. The method of Claim 10 wherein the binder comprises:
sodium silicate;
ethyleneglycol diacetate;
20 water;
a hardening agent; and,
a surfactant.
14. The method of Claim 13 wherein the binder comprises a means for resiliency.
25
15. The method of Claim 13 wherein the binder comprises a means for porosity.
16. The method of Claim 10 wherein the base layer comprises soil.
- 30 17. The method of Claim 10 wherein the base layer comprises an aggregate material.

18. The method of Claim 17 wherein the aggregate material includes stone.
19. A method of providing a synthetic turf system, the method comprising the
5 steps of:
compacting an aggregate material into a base layer; and,
applying a binder to the base layer.
20. The method of Claim 19 wherein the binder comprises a means for resiliency.
10
21. The method of Claim 19 wherein the binder comprises a means for porosity.
22. The method of Claim 19 wherein the binder comprises:
sodium silicate;
15 ethyleneglycol diacetate;
water;
a hardening agent; and,
a surfactant.
- 20 23. The method of Claim 22 wherein the binder comprises a means for resiliency.
24. The method of Claim 22 wherein the binder comprises a means for porosity.
25. The method of Claim 19 wherein the base layer comprises soil.
25
26. The method of Claim 19 wherein the aggregate material includes stone.
27. The method of Claim 19 further comprising:
laying a turf layer over the base layer.
30
28. The method of Claim 27 wherein the turf layer comprising:

a backing; and,
a plurality of synthetic ribbons attached to the backing,
wherein the turf layer lies over the base layer.

5 29. The method of Claim 19 further comprising:
 mixing the binder.

 30. The method of Claim 29 wherein the binder comprises:
 a ratio of 2 parts sodium silicate to 1 part ethyleneglycol diacetate and
10 surfactant.

 31. The method of Claim 29 wherein the binder comprises:
 a ratio of 4 parts water to 1 part ethyleneglycol diacetate and surfactant.

15 32. The method of Claim 19 wherein applying the binder to the base layer
 comprising:
 spraying the binder at a rate of substantially 1.5 – 4 liters per square meter.

 33. A synthetic turf system substantially as shown and described herein.

20

 34. A method of providing a synthetic turf system substantially as shown and
 described herein.

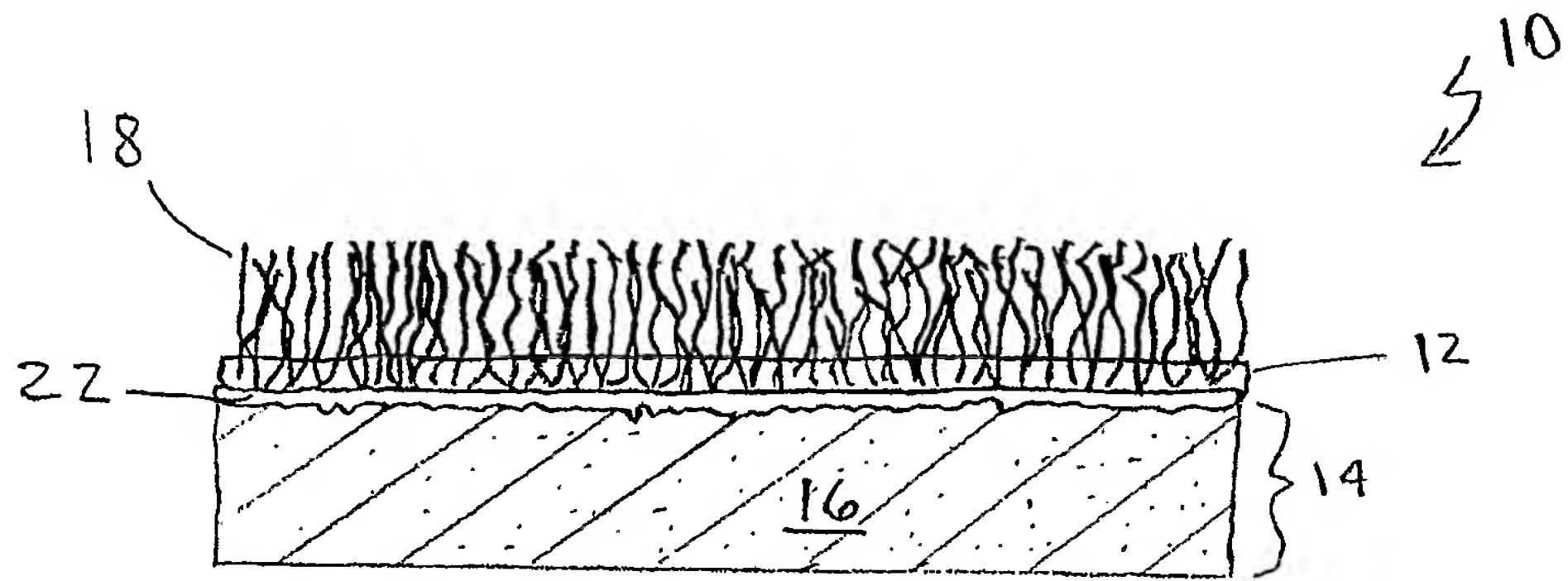


FIG. 1

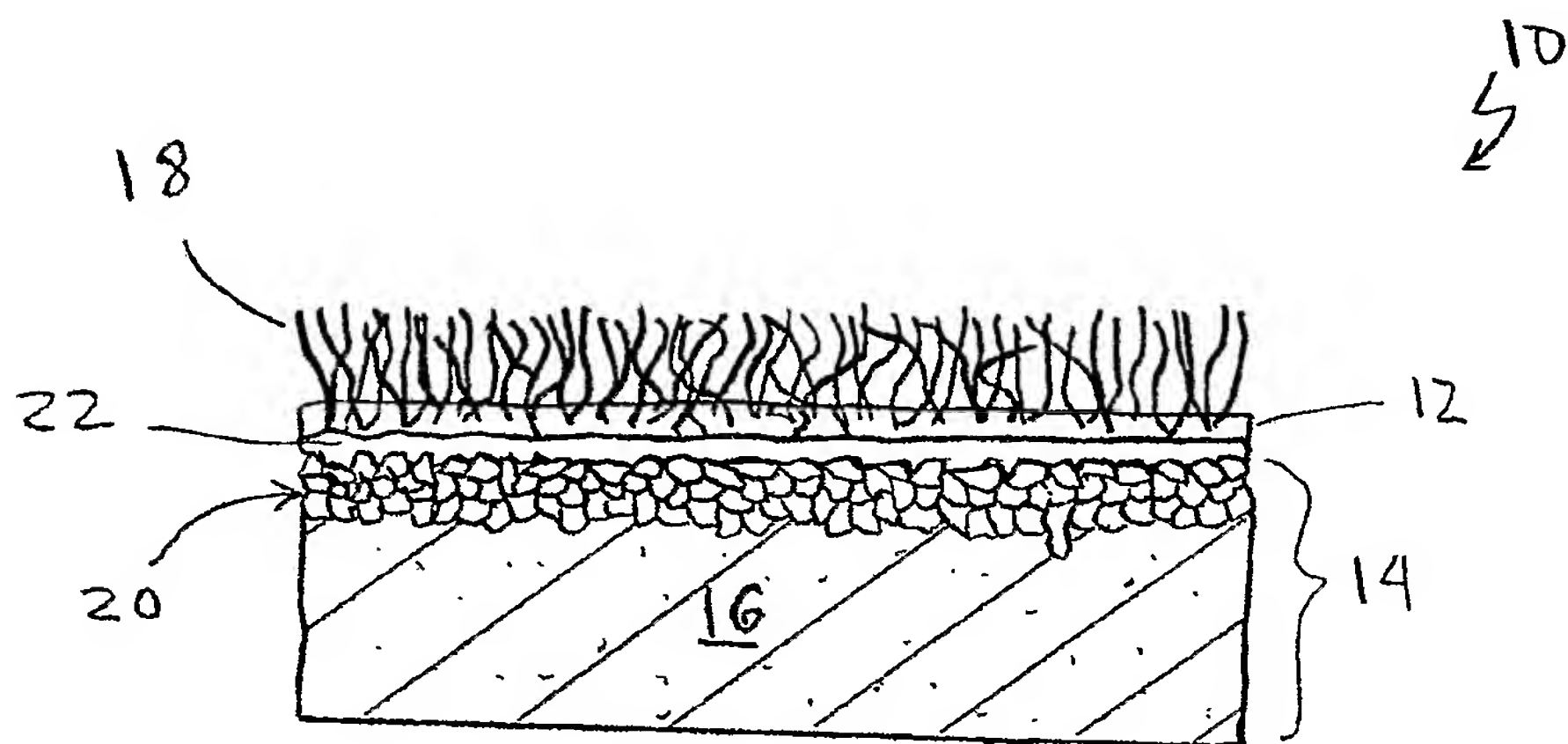


FIG. 2